CLAIMS

1. An apparatus for pumping an electrically conductive material, the apparatus comprising:

an outer open tube having a closed bottom;

an open mid tube disposed within the outer tube to form an annular volume between the inner wall of the outer tube and outer wall of the mid tube, the top of the annular volume in communication with an outlet for exit of the electrically conductive material from the apparatus;

an open inner tube disposed within the mid tube;

a magnetic material disposed between the outer wall of the inner tube and the inner wall of the mid tube;

an inlet for entry of the electrically conductive material into the open inner tube, the inlet disposed near the top of the open inner tube and in communication with the opening in the inner tube;

a plurality of induction coils disposed around the exterior height of the outer tube; and

a means for supplying an ac current to each of the plurality of induction coils to force the electrically conductive material up through the annular volume and the outlet by the magnetic forces applied to the electrically conductive material by the magnetic fields created by the supply of the ac current to each of the plurality of induction coils.

2. The apparatus of claim 1 wherein the means for supplying the ac current to each of the plurality of induction coils comprises a power supply having a three phase output wherein each two of the three phases, with alternating positive and negative phase orientation, are sequentially connected to the plurality of induction coils to create a six phase cycle of the magnetic fields to force the electrically conductive material up through the annular volume and the outlet.

3. The apparatus of claim 2 wherein the power supply has a variable output voltage or output frequency.

4. The apparatus of claim 1 wherein each of the plurality of induction coils comprises a bobbin magnetic coil.

5. A method of pumping an electrically conductive material comprising the steps of:

providing a supply of the electrically conductive material into an opening of an open inner tube;

inserting an open mid tube around the exterior of the inner tube;

inserting an open outer tube with closed bottom around the exterior of the mid tube to form an annular volume between the mid tube and the outer tube, the annular volume in communication with the electrically conductive material in the open inner tube;

disposing a magnetic material between the outer wall of the inner tube and the inner wall

of the mid tube;

surrounding the exterior of the outer tube with a plurality of induction coils; and

applying an ac current to each of the plurality of induction coils to force the electrically conductive material up through the annular volume and the outlet by the magnetic forces applied to the electrically conductive material by the magnetic fields created by the ac current in each of the plurality of induction coils.

6. The method of claim 5 further comprising the step of supply the ac currents to each of the plurality of induction coils from a three phase supply wherein each two of the three phases, with alternating positive and negative phase orientation, are sequentially connected to the plurality of induction coils.

7. A method of pumping an electrically conductive material comprising the steps of:

providing a supply of the electrically conductive material into a supply volume formed in an open inner tube;

inserting an open mid tube around the exterior of the inner tube;

inserting an open outer tube with closed bottom around the exterior of the mid tube to form a magnetic force pumping volume between the mid tube and the outer tube, the magnetic force pumping volume in communication with the supply volume;

disposing a magnetic material between the inner tube and the mid tube;

surrounding the exterior of the outer tube with a plurality of induction coils; and

applying ac current to each of the plurality of induction coils to move the electrically conductive material through the magnetic force pumping volume by magnetic forces applied to the electrically conductive material by the magnetic fields created by the ac current in each of the plurality of induction coils, thereby moving the supply of electrically conductive material through the supply volume and into the magnetic force pumping volume with the directional flow of the electrically conductive material in the supply volume generally opposite to the directional flow of the electrically conductive material in the magnetic force pumping volume.

8. The method of claim 7 further comprising the step of supply the ac currents to each of the plurality of induction coils from a three phase supply wherein each two of the three phases, with alternating positive and negative phase orientation, are sequentially connected to the plurality of induction coils.

9. An apparatus for pumping an electrically conductive material, the apparatus comprising:

an open outer tube, the opening in the bottom of the outer tube in communication with an inlet for entry of the electrically conductive material into the open outer tube;

an open mid tube disposed within the outer tube to form an annular volume between the

inner wall of the outer tube and outer wall of the mid tube, the mid tube having a closed bottom, the top of the annular volume in communication with an outlet for exit of the electrically conductive material from the apparatus;

an inner tube disposed within the mid tube;

a magnetic material disposed between the outer wall of the inner tube and the inner wall of the mid tube;

a plurality of induction coils disposed around the exterior height of the outer tube; and

a means for supplying an ac current to each of the plurality of induction coils to force the electrically conductive material up through the annular volume and the outlet by the magnetic force applied to the electrically conductive material by the magnetic fields created by the supply of the ac current to each of the plurality of induction coils.

10. The apparatus of claim 9 wherein the means for supplying the ac current to each of the plurality of induction coils comprises a power supply having a three phase output wherein each two of the three phases, with alternating positive and negative phase orientation, are sequentially connected to the plurality of induction coils to create a six phase cycle of the magnetic fields to force the electrically conductive material up through the annular volume and the outlet.

11. The apparatus of claim 10 wherein the power supply has a variable output voltage or output frequency.

12. The apparatus of claim 9 wherein each of the plurality of induction coils comprises a bobbin magnetic coil.

13. A method of pumping an electrically conductive material comprising the steps of:

supplying the electrically conductive material into an opening in the bottom of an open outer tube;

connecting the open bottom of the outer tube with an annular volume formed between the outer wall of a mid tube and the inner wall of the outer tube;

disposing a magnetic material between the outer wall of an inner tube and the inner wall of the mid tube;

surrounding the exterior of the outer tube with a plurality of induction coils; and

applying ac current to each of the plurality of induction coils to force the electrically conductive material up through the annular volume and an outlet by the magnetic force applied to the electrically conductive material by the magnetic fields created by the ac current in each of the plurality of induction coils.

14. The method of claim 13 further comprising the step of supply the ac currents to each of the plurality of induction coils from a three phase supply wherein each two of the three phases, with

alternating positive and negative phase orientation, are sequentially connected to the plurality of induction coils.